and R. H. Traquair. An indispensable 'Handbuch der Palaeontologie' is that of Karl A. Zittel (1890), in which the knowledge of fossil fish is brought up to a recent date. The most valuable general work is the 'Catalogue of the Fossil Fishes in the British Museum,' in four volumes, by Dr. Arthur Smith Woodward, a most worthy companion of Günther's 'Catalogue' of the living fishes, and still more modern in the taxonomy and views of relationships. Important contributions are those of Huxley, F. McCoy, van den Marck, de Koninck, Davis, Nicholson, Charlesworth, Sir Philip Egerton, Rictet, Kner, von Meyer, Hasse, Thiollière, Jaekel, Rohon, Sauvage, Stolicza, Lawley, Molin, Gibbes, Probst, Karpinsky, Kipryanoff and many others.

In America, Dr. John Strong Newberry has studied the fossil fishes of Ohio. Professor Edward W. Claypole has worked largely in the same region. Edward Drinker Cope and Dr. Joseph Leidy have added to our knowledge of the Eocene and Cretaceous fishes of the Rocky Mountains. Numerous recent papers of great value have been published by Dr. Bashford Dean, of Columbia University, and Dr. Charles R. Eastman, of Harvard. Other important records are due to Orestes St. John, A. H. Worthen, Charles D. Walcott and the Redfields, father and son.

Still more difficult of enumeration is the long list of those who have studied the anatomy of fishes, usually in connection with the comparative anatomy or development of other animals. Preeminent among these are Karl Ernst von Baer, Cuvier, Goffrey St. Hilaire, Louis Agassiz, Johannes Müller, Carl Vogt, Carl Gegenbaur, Meckel, William Kitchen Parker, Francis M. Balfour, Thomas Henry Huxley, H. Rathke, Richard Owen, Kowalevsky, H. Stannius, Joseph Hyrtl, Gill, Boulenger and Bashford Dean. Other names of high authority are those of Wilhelm His, Köliker, Bakker, Rosenthal, Gottsche, Miklucho, Macleay, Weber, Hasse, Retzius, Owsjannikow, H. Müller, Stieda, Marcusen and Ryder.

Besides all this, there has risen, especially in the United States, Great Britain, Norway, Canada and Australia, a vast literature of commercial fisheries, fish culture and angling, the chief workers in which fields we may not here enumerate even by name.

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*JOINT MEETINGS OF THE GEOLOGICAL SOCIETY OF AMERICA, SECTION E, AND THE NATIONAL GEOGRAPHIC SOCIETY.**

The Geology of the Pittsburgh District: I. C. White.

The Appalachian coal field begins near the northern line of Pennsylvania, and extends in a canoe-shaped trough 900 miles southwestward, ending in western Alabama. Pittsburgh is situated near the center of the northern end of this great basin, and has, therefore, easy access to all of the coal formations.

To one of these beds, the great Pittsburgh seam, which overlooks the city from an elevation of 350 feet, and extends up the Monongahela for 200 miles, the industrial supremacy of the region is largely due.

Several years ago the gifted Blaine predicted that the Pittsburgh district would in time become the manufacturing center of the world because of its command of cheap fuel. This prophecy has become a reality within less than a decade of its utterance.

The Monongahela formation, of which the Pittsburgh coal is the basal member, caps all the hills around the city and stretches away to the south up the river which gave the beds a name, to be in turn covered up by the Dunkard formation at

* Pittsburgh, Pa., July 1 to 3, 1902.

the summit of the Carboniferous column and probably of Permian age. The city itself is located mostly on the Conamaugh formation or the old Barren Series of Rodgers, the central red beds of which crop along all the railroads which enter the city and give no end of trouble from landslides, slips and caves. These red beds enclose one of the most interesting deposits of the entire Carboniferous column, viz., the Ames or Crinoidal limestone. It marks the end of marine life in the Carboniferous waters of the Appalachian field, and is a most important 'key' rock. Coming as it does 300 feet below the Pittsburgh coal bed, and at an equal interval above the Upper Freeport seam, it has been traced from central West Virginia around through western Pennsylvania, across Ohio, and back into southern West Virginia near Huntington.

Within easy access from Pittsburgh the geologist may see all of the Carboniferous, and on the crest of the great Chestnut Ridge arch above Connellsville get a peep deep down into the Devonian.

This, however, has been given in the diagram before you, which represents the rocks under Pittsburgh as revealed in the deepest oil boring ever made in America, and, with one exception, the deepest in the world. This record we owe to the intelligent interest in pure science of Mr. W. J. Young, of Pittsburgh, now at the head of the great producing interests of the Standard Oil Co. At an expense of many thousands of dollars Mr. Young drilled this well near West Elizabeth, Pa., to a depth of 5,575 feet, and gave to Professor Hallock, of Columbia University, the opportunity to make his important contributions to earth temperatures. This is but one of numerous examples of encouragement to pure science given by the officers and agents of that much-abused organization.

But interesting as are the stratified rocks of the remote past in the Pittsburgh region, the surface deposits tell for many a still more attractive story. The clays, silts, sands, gravels and cobbles which rest upon the ancient river bottoms, and mantle up the slopes to 300 feet above the present streams, unfold a most interesting history. They reveal a river during Tertiary time flowing with its bed immediately under the site of the Carnegie Institute, 200 feet above the present streams, descending with gentle fall (only one third the rate of the present rivers), and at Beaver, instead of turning southward down the Ohio, keeping northward and joining the St. Lawrence system in the region of Lake Erie.

Then in Quaternary time, this northward-flowing river was met by a great mass of southward-moving ice and other glacial débris which effectually impounded the Allegheny and Monongahela drainage, and caused their waters to intermingle across the East Liberty valley, and finally to cut a new pathway to the sea along what is now the Ohio River. This great inland lake is marked by a series of deposits of clay, sand, boulders and other transported materials upon all except steep surfaces up to a little more than 1,000 feet above tide over the entire basin of the two rivers. Mr. Campbell, of the U. S. Geological Survey, has recognized the character of these upland deposits as having been made in a lake-like body of water, but has erroneously referred them to a local ice dam. The one great dam which we know existed just north from Beaver will explain all the phenomena.

The Lower Carboniferous of the Appalachian Basin: J. J. STEVENSON. (Read by title.)

In this paper a description is given of the several divisions of the Lower Car-

boniferous as they exist in the Appalachian basin; the effort is made to determine the boundary between Devonian and Carboniferous and to ascertain the changes in physical geography during the period.

A New Meteorite from Algoma, Kewaunee County, Wisconsin: William Herbert Hobbs.

The Algoma meteorite, which was plowed up near Algoma, Wis., in 1887, was recognized in March of the present year as a true meteorite. It is almost unique among meteorites because of its peculiar shape and surface markings. Whereas most meteorites are quite irregular in form, this meteorite is in the shape of a thin shield, or disk, with convex and concave sides. Contrary to common notions it is quite clear that this body, when it entered the atmosphere of the earth, presented its convex surface to the front, and was in part by the erosion of the air given its present form, and its convex surface was deeply eroded. From a central, smooth, elliptical area upon the front, radial and slightly spiral groovings proceed to the circumference of the meteorite. It seems clear that these groovings and ridges are the result of fusion and erosion by the compressed air, the dead-air area in front of the center preventing a similar grooving there.

Although not generally appreciated, it appears that there have been other disk-like meteorites, and from the principles of mechanics it is clear that they, like the Algoma meteorite, must have moved through the atmosphere with their broad side on.

The Algoma meteorite shows well the Widmanstätten figures produced by etching, and also numerous crystals of schreibersite.

The Meteorites of Northwestern Kansas. Oliver C. Farrington.

Of the thirteen meteorites known from Kansas, six have been found within an area 115 miles long by 85 miles broad in the northwestern part of the State. As these all resemble each other in outward appearance the question has been raised as to whether they belong to a single fall. In deciding the question the probable course of a meteor and the structure and composition of the meteorites should be discussed. It is shown that the probable course of the meteor would have been from southeast to northwest, and not from southwest to northeast as would be required if the meteorites belonged to a single fall. As regards structure and composition, three of the meteorites have been studied, while the other three have not. Results of studies of two of the latter, Long Island and Franklinville, are given and the Long Island meteorite shown to be, in several respects, remarkable. The conclusion is reached that two of the meteorites may belong to one fall but that the others are single individual falls.

The Mohokea Caldera on Hawaii: C. H. Hitchcock.

The eruptions from Mauna Loa upon the southwest side are different from those upon the northeast, chiefly in being of the explosive type. The new map of Hawaii develops the interesting facts of the existence of an immense depression analogous to a caldera a few miles back from Punuluu. It is of larger dimensions than the celebrated calderas of Mauna Loa and Kilauea.

Ellipsoidal Structure in the pre-Cambrian Basic and Intermediate Rocks of the Lake Superior Region: J. Morgan Clements.

The greenstones of pre-Cambrian age in the Lake Superior region have very com-

monly developed in them a structure which, since the masses separated by this structure are ellipsoidal, is designated 'ellipsoidal' structure. This structure was described and illustrated by means of lantern slides.

A review of the ideas held by various observers concerning the origin of this structure was given, and the conclusion was reached that the 'ellipsoidal' was an original structure due to the breaking up of a viscous lava while it was being extruded. The structure is of widespread occurrence, especially in the greenstones of the Lake Superior region.

The desirability of using the term 'ellipsoidal' instead of 'spheroidal' in referring to this structure is urged in view of the fact that it is an original structure, and that the bodies formed by this structure are ellipsoidal, whereas the spheroidal structure in the rocks is of secondary nature and is due to exfoliation caused by weathering.

Vermilion District of Minnesota: J. MORGAN CLEMENTS.

The Vermilion district occurs in northeastern Minnesota, extending from Vermilion lake, N. 70° E., to Gunflint lake on the international boundary. As described the district is about eighty miles long by ten miles wide. The area surveyed comprises nearly 1,000 square miles. The stratigraphic succession is as follows, given in descending order:

Pleistocene	Glacial drift.
(Unconformity).	
Keweenawan	Great Gabbro and Logan sills.
(Unconformity).	
Upper Huronian (Animikie series). Confined to eastern end of district	Upper slate formation. Gunflint formation (iron-bearing).
(Unconformity).	
Lower Huronian	Intrusives. Knife slates. Lower Huronian iron-bearing formation. Ogishke conglomerate.
(Unconformity).	
Archean (Vermilion series)	Intrusive granites, porphyries and greenstones. Soudan formation (iron-bearing). Ely greenstone.

The structure is complex. The Vermilion district is broadly a great complex synclinorium bounded on the north by the Archean granite, and on the south by the Huronian granite, Keweenawan gabbro, with the Upper Huronian slates coming in for a short distance. The ores are high-grade hematites, averaging 63 per cent. of iron and .05 per cent. of phosphorus, and they are found in structural basins. Since this district began to ship ore in 1884, it has sent out some 17,000,000 tons of ore, and the greater part of this came to Pittsburgh.

As regards the origin of the iron, it appears to come first from preexisting rocks, and then it is deposited to form the sedimentary iron-bearing formations. In the case of the Archean Soudan, the most economically important iron-bearing formation of this region, the iron comes from the Archean greenstone (basic and intermediate intrusives and volcanics). Later, after the folding, the iron is leached from the iron-bearing formation chiefly, and after being carried down by descending meteoric waters is precipitated as the oxide in places favorable for its accumulation, thus forming the ore deposits.

The Pacific Mountain System of British Columbia and Alaska: ARTHUR C. SPENCER.

The author brought together and attempted to interpret the existing descriptions of the physiography of the coastwise

mountains of British Columbia and Alaska. The term *Pacific Mountains,* which was used by Powell as a designation for the westernmost ranges of the United States, was extended to apply to the mountain ranges contiguous to the Pacific Ocean from Lower California to the Alaskan peninsula.

North of the United States the mountains are generally flat-topped and their uniform summits are considered to represent uplifted peneplains. Back of them the plateaus of the interior are of similar origin. Reasoning from the antecedent character of the rivers which head in the inland plateau, and cross the coastal mountain belts, and also from local merging of interior and mountain plateaus, it was shown that the peneplains of the various regions can be correlated. A great seaward-sloping surface of erosion was produced in Eocene time, and upon it the precursors of the present drainage systems were developed. Since the completion of this peneplain, all of the existing mountains have been formed, mainly by differential uplift attendant upon the general elevation of northwestern North America.

Development of the Southeastern Missouri Lowlands: C. F. Marbut. (Abstract read by W. M. Davis.)

The lowland region of southeastern Missouri consists of two broad belts of flat lowland with a discontinuous ridge between them. One of the lowland belts is an abandoned valley of the Mississippi river, the other is the valley of the Ohio. The Mississippi river has gained its existing valley by two successive changes, abandoning first about 200 miles of its original valley, and later about twenty more. It was led to abandon its valley because of a shorter and steeper course having been offered it by the Ohio. The Ohio drainage first captured some of the small tributaries of the Mississippi and later the Mississippi turned itself into these valleys in succession by sapping the ridge between. Since the capture of the Mississippi, several of the smaller rivers of the region have abandoned their older valleys.

Note.—The above papers were presented through the Geological Society of America, and for more complete accounts of the same see *Bulletin G. S. A.*, Vol. XIII., 1902.

The following papers were offered directly to Section E:

The International Geographic Congress of 1904 under the Auspices of the National Geographic Society: Gilbert H. Grosvenor. (Read by title.)

Possible Effects of the Glacial Period upon the Land Levels of Central Asia: G. Frederick Wright.

That northern and central Asia has experienced an extensive subsidence in recent geological time is proved by a variety of evidence:

1. Stadling reports gravel terraces containing fresh pieces of wood several miles back from the lower part of the Lena river, 650 feet above it. In some cases these terraces contain the bones of the mastodon and are resting upon solid ice.

2. On the south shore of the Black sea at Trebizond and Samsun, and upon the north shore around the Crimea, there are fresh gravels which are evidently beach deposits, hanging upon the sides of cliffs, indicating a recent subsidence of that whole region to the extent certainly of 750 feet.

3. In the Dariel pass, on the north side of the Caucasus mountains, a few miles above Vladikavkas, there are extensive recent water deposits, with the finer material at the bottom and the coarser material at the top, which could have accumulated only when the gradient of the incline was very

much less than it is now. These accumulations are sometimes more than 200 feet thick, and are beyond the reach of any glaciers which ever extended down the north side of the range. While these do not indicate a depression below the surface of the ocean, they do necessitate a depression to the south such as would change the relative level of the valley occupied by the upper part of the Terek river.

4. The existence of arctic seal (*Phoca annelate*) in Lake Baikal is best explained on the theory of a recent depression, permitting the sea to extend inwards to all the points now marked by that level. The lake is 1,561 feet above the sea, and fully 2,000 miles distant as the river runs. The presence of the seal in the lake is readily explained by this supposition of a recent subsidence of the region, but is not satisfactorily explained by any other theory. Reaching the enclosure while it was an arm of the sea, the seal would find a favorable habitat, and when, on re-elevation of the land, the basin became cut off from direct communication with the sea, the water would still be salt, and would grow fresh so gradually that the species could adjust itself to the slowly changing conditions and remain a permanent inhabitant. The same seal is also found in the Caspian sea, and was formerly found in the Aral sea.

5. The distribution of the loess around the base of the Alatau and other immense mountain masses of central Asia is such as to indicate a temporary water level from 2,500 to 3,000 feet higher than now. Whatever may have been the ultimate origin of this peculiar soil, its distribution in northern China, in Turkestan, about the base of Mount Ararat, at the southern base of the Caucasus mountains, and over the plains of southern Russia, is unaccountable except by the assistance of water action; while the occurrence of the bones of post-Pliocene animals and the remains of man underneath it, both in Russia and in Siberia, together with the small amount of erosion that has taken place in it, indicates that the change of level was approximately contemporaneous with the glacial period both in America and in northwestern Europe.

The result of observations in eastern Mongolia, Manchuria, Transbaikalia, and along the base of the Tian Shan range in Turkestan was to show that, during the glacial period, there was no extension of ice anywhere in Asia south of the sixtieth degree of latitude at all corresponding to that in America and in Europe; therefore, the weight of ice could not explain the depression of the Asiatic continent.

But the removal of 6,000,000 cubic miles of water from the ocean bed to form the glaciers of Europe and America, which would be equal to 24,000,000,000,000,000 tons, would naturally so disturb the balance of forces that a continental mass like Asia, with mountains rising from 25,000 to 30,000 feet above the sea, would sink down by its own weight.

Recent Geology of the Jordan Valley: G. FREDERICK WRIGHT.

West of the Jordan the descent from Jerusalem to Jericho is something more than 3,000 feet in about fifteen miles, and the underlying rock is all Cretaceous, the strata dipping to the east even more rapidly than the road descends. A fault of some 4,000 to 5,000 feet occurs along the Jordan valley, so that the abrupt wall which forms the western face of the mountains of Moab has at its base Nubian sandstone strata which underlie the Cretaceous, the Cretaceous rocks appearing near the summit, where the elevation is about 4,000 feet above the Dead sea, or nearly the same as that of Jerusalem and the surrounding hills of Judea.

Approximately the grand movements producing this fault may be fixed as beginning in the Middle Tertiary period, since Lower Tertiary rocks, consisting of nummulitic limestone, are found on Mounts Carmel, Ebal and Gerizim, and on some of the heights in the vicinity of Jerusalem and to the south of Hebron.

The extensive post-Tertiary deposits of silt extend as high as 750 feet above the Dead sea, showing that up to a recent time the water was 750 feet higher than now, producing a lake several times larger than the Dead sea, and extending southward about forty miles beyond the Dead sea, in which were deposited hundreds of feet of fine sediment where side streams came in, and one hundred feet or more over the entire valley. In the wady Zuweiya, where it enters the depression near the south end of the Dead sea, one can see the fine laminæ of this sediment as it has gradually accumulated to a depth of between 200 and 300 feet just below the 750-foot line, and where it has been exposed by subsequent erosion.

The Jordan valley throughout all its lower portion occupies a narrow gorge which it has cut out of this sedimentary deposit. The river is constantly undermining its banks, now on one side and now on another, leaving, pretty generally, perpendicular walls of the sedimentary deposits separated from the river by a flood-plain of varying width, averaging about a quarter of a mile. As a consequence the river is extremely muddy as it enters the Dead sea.

Notwithstanding the vigor of these erosive agencies only a relatively small portion of the sediment has been washed away, and the Dead sea is still unfilled, which is a witness to the recentness of its formation. The drainage basin of the Jordan valley is more than 10,000 square miles in extent; while the immediate valley itself is scarcely one fifteenth as large. All the wash of this large drainage area finally lodges in the valley.

If we estimate the rate of erosion in the drainage basin of the Jordan at one foot in 2,000 years, the age of the Jordan fault must be reckoned in tens of thousands of years, rather than in hundreds of thousands; thus confirming the shorter geological chronology of the physicists.

History of the Discoveries and Discussions Concerning the Glacial Terraces in the Upper Ohio and its Tributaries: G. Frederick Wright.

Submerged Valleys in Sandusky Bay: E. L. Moseley.

Tilting of the earth's crust is causing a depression of the land at the southwest extremity of Lake Erie as compared with the outlet at Buffalo. The effect of this is shown in the vicinity of Sandusky by the extension of the water over the low ground as evidenced by surveys, submerged stumps, slack water in the lower course of all the streams and submerged stalagmites in the caves of Put-in bay. It is also shown by the fact that from the mouth of each stream entering Sandusky bay a valley now filled with mud can be traced out through the bay. These valleys show a rise of the water of at least forty feet.

Some Geological Notes in Honduras, Central America: J. Francis Patch-Le Baron. (Read by title.)

The main geological features of Honduras are volcanic, but of a former age. These features are more pronounced on the Pacific slope, but there are at present no live volcanoes in the Republic.

The greater part of the stratified formations belong to the Permian. The characteristic country rock in the departments of

Olancho, Yoro and Mosquitia is a quartzose conglomerate, 1,000 feet in thickness. In the vicinity of Tegucigalpa, the characteristic section is composed of red and green marls nearly a thousand feet thick. These are capped with limestones, red conglomerates, sandstones and shales, very rich in gold and silver. The beds of non-fossiliferous limestones in Honduras are immense, and we find the old sea basins in many places 3,000 feet above present sea-level.

Granite and syenite occur on the coast west of Trujillo, and basalts and lavas are found all over the country in great abundance.

Geological classification is difficult in Honduras on account of the great mass of eruptive rocks which have been greatly metamorphosed.

The Great Canyon of the Euphrates River: ELLSWORTH HUNTINGTON.

Although the Euphrates river is known by name to every one certain parts of its upper course are still almost unexplored. One of the least known sections is where the river, after the junction of its two largest branches, flows over great rapids through the Taurus mountains in an immense canyon.

In 1883 the great German general von Moltke floated down this part of the stream on a raft of inflated sheepskins manned by Kurds, but the rapids are so formidable that for over sixty years no other Europeans visited the region. In the spring of 1901 Professor T. H. Norton, U. S. Consul at Harput, Turkey, and the writer made the same journey, using a raft of inflated sheepskins manned by Armenian fishermen. For the first hundred miles no great difficulties were met, although at one place the Kurds threatened the party with their guns, because the strangers floated past the place where a Kurdish lord had the right of ferriage. In another place a crowd of Turkish villagers stoned the raft because the Armenian fishermen had no fish to sell. In both cases the natives refrained from further violence out of respect for the fact that the travelers wore hats and so must be men of consequence.

Two small canyons were traversed, the second of which, nearly 2,000 feet deep, was the picturesque home of large herds of ibex. Below this is a holy mountain, with several shrines, at one of which rises an immense square altar of rough stone, all covered with the gore of the numerous goats and sheep which are here offered in sacrifice by both Christian Armenians and Mohammedan Turks.

The main canyon is cleft through the mountains to a depth of from 2,000 to 5,000 feet, and the contracted stream thunders over rapid after rapid between towering walls of frowning basalt or castellated buff limestone. In many ways it resembles the grand canyon of the Colorado, with its exceedingly swift current obstructed here and there by fans of detritus brought in from the sides, its steep walls of naked rocks and its raging rapids. In some places the main stream has cut its gorge so fast that the smaller tributaries could not keep pace with it, and so fall over the walls into the river in a series of cascades. All these facts and many others show that the Euphrates is very young geologically.

The real difficulties of the voyage began in the great canyon. At the first big rapid a whole day was spent in making a portage of two miles, involving a climb of 1,200 feet over an almost impassable road; in another place, while the raft was being let down past a rapid with ropes, a raft of logs floated by, on which were two almost nude Kurds, with tridents for paddles and

strings of dried gourds around their waists for preservers.

The difficulties became greater and greater as the party floated swiftly into the wilder parts of the canyon, where rapids were shot far larger than those where portages had been made a day or two earlier. The raftsmen's nerves were so completely unstrung one night that they dared neither shoot the rapids, nor climb the mountain side to get help from the Kurds in making a portage. Next day, the wildest of all the rapids was reached. The raftsmen dared not shoot it, and a portage was out of the question, so the Americans decided to shoot it alone, in spite of the entreaties of the servants, who fell on their knees, and, with tears in their eyes, begged the foreigners not to go to certain death. The raft shot into the rapids over a long smooth, tilting sheet of water; there was a wild exhilarating slide, and the great waves broke over the explorers, time and time again wetting them through to the skin; the raft whirled round and round. Soon the danger was passed, and the raft safely moored. The journey lasted seven days because of the numerous portages, although the actual time occupied in floating on the river was but thirty-seven hours.

The youthfulness of the deeper part of the canyon seems to be due to a recent revival of deformation, which has caused the streams to incise deep, steep-sided, V-shaped, young valleys in the bottoms of broad, U-shaped, older valleys.

Systematic Geography: W. M. Davis.

Observations of geographical matters by travelers and explorers are usually incomplete in one respect or another, largely because there is no maturely developed and generally accepted scheme of systematic geographical classifications, by which the relation of the whole of the subject to its parts is concisely indicated. The facts of inorganic environment on the one hand (physiography) and of environed organisms on the other (ontography), which constitute, when studied in their mutual relations, the subject matter of geography proper, can only be appreciated after careful analysis and arrangement. Geography may be given a regional aspect when the features of a single region are considered; but complete regional description implies a previous understanding of general systematic geography; for otherwise, regional facts cannot be recognized as examples of the large classes of facts in which they fall. Systematic geography is therefore a fundamental study. The author outlined the chief subdivisions of its two parts, physiography and ontography, and discussed the order in which the relations between them should be considered.

Some Topographic Features in the Southern Appalachians: J. A. Holmes.

The Petrographic Province of Neponset Valley, Boston, Massachusetts: F. Bascom. (Read by title.)

The Occurrence of Liquid Petroleum Hermetically Enclosed with Quartz Crystals, from Alabama: F. L. Stewart.

Restoration of Embolophorus dollovianus: E. C. Case. (Read by title.)

Synopsis of the Missourian and Permo-Carboniferous Fish Fauna of Kansas and Nebraska: C. R. Eastman and E. H. Barbour.

The majority of Upper Carboniferous fish remains from Nebraska are from the Atchison shales in the southeastern part of the State, and consist almost exclusively of Elasmobranchs. Some of these are intimately related to those of older horizons from the region east of the Mississippi, including even the Chester limestone, and a

lesser number are suggestive of a Permian aspect. Only a few species occur in the Permo-Carboniferous of Nebraska, and at least one of them is identical with a Permian species from the Red Beds of Texas. The Upper Coal Measure fish fauna of Kansas is slightly more varied than that of Nebraska, Dipnoans and Crossopterygians being represented besides Elasmobranchs. Altogether, more than twenty species of fish remains are known from this region.

Phylogeny of the Cestraciont Group of Sharks: C. R. EASTMAN.

The family of Cestraciont sharks has had a continuous existence since the Devonian, a range which is paralleled among fishes only by the *Ceratodus* group of Dipnoans. Some of the Devonian and Carboniferous forms (*Protodus, Campodus, Edestus, Helicoprion,* etc.) were remarkable for their great development of symphysial teeth, which became coiled without being shed, but none of these specialized genera are known to have survived the Paleozoic. This family probably gave rise to the Cochliodonts with inrolled crushing teeth in the Middle Paleozoic, and to the modern ray type during the Mesozoic. The existing Port Jackson shark is the sole survivor of the generalized Cestraciont stem, and special importance is attached to a study of its embryological phases.

On a Complete Skeleton of a New Cretacean Plesiosaur, Illustrated from Photographs from Mounted Skeletons: S. W. WILLISTON.

The Bacubirito Meteorite: H. A. WARD.

Bacubirito is a small but very old mining town situated on the Rio Sinaloa in latitude 26° and in west longitude 107°. The elevation above sea-level is some 2,000 feet. The meteorite is seven miles nearly due south from there, near the hamlet called Palmar de la Sepulveda. It was struck by the plow of Crescencio Aguilar in the summer of 1871. He soon uncovered enough of its bright surface to satisfy himself that he had found a silver mine! Its surrounding is now a cornfield, with a black vegetable soil of some two yards in thickness. In this soil we found the great meteorite deeply imbedded. Its surface was but a little below the surface of the ground.

The general form of the mass seen from the side was that of one ramus of a huge jaw. The surface was entirely covered with 'pittings,' very regular in size, and about two to three inches across, shallow, but with well-defined walls. There were no areas which showed the devastation of deep rust; a fact due both to the dryness of the soil and to the large alloy of nickel in the iron. On one side there was a deep crack, running horizontally through half the length of the mass. At one end this crack was too narrow to insert a knife blade, at the other end it was nearly three inches wide. Over the area the vegetable soil was from three to four feet deep, while below it was a porphyry rock, common in this part of the country, much broken up by natural cleavages and decomposed *in situ.*

Immediately around the meteorite we had dug much lower, leaving the great iron mass poised on a pillar or pedestal of the undisturbed rock. It needed little mechanical aid to make the mass turn over. Looking beneath it we found that its late bed was a clean depression crushed into the rock, with absolutely no soil between it and the mass which had lain above it.

The extreme measures of Bacubirito, for so our meteorite from the first has been called, are:

Length	13	feet	1	inch.
Width	6	"	2	"
Thickness	5	"	4	"

The form of the mass is extremely irregular, and though measures have been taken around the mass at many different points, its cubic contents cannot be calculated with more than an approximation to accuracy.

The five largest meteorites known to science to-day are:

Bemdego (Brazil)	5⅓	tons.
San Gregoria (Mexico)	11½	"
Chupaderos (Mexico)	15⅔	"
Anighito (Greenland)	50	"
Bacubirito (Mexico)	50	"

The first three are weights proven on scales: the last two are thus far simple estimates.

Whichever meteorite shall, after accurate calculation, prove to be the heavier, it will ever remain of interest that the two largest meteorites known to our earth have fallen on the North American continent—one far toward its northern end, the other toward its southern.

Paleontological Notes: (a) Notes on Gastropods, (b) Spirifer mucronatus and its Derivatives: A. W. Grabau. (Read by title.)

The following papers were read under the auspices of the National Geographical Society:

Scientific Results of the Recent Eruptions in the West Indies: R. T. Hill.

The Magnetic Disturbances during the Time of the Recent Volcanic Eruptions in Martinique: L. A. Bauer.

Atmospheric Phenomena in Connection with the Recent Eruptions in the West Indies: A. J. Henry. (Read by G. H. Grosvenor.)

F. P. Gulliver,
Secretary, Section E.

DR. J. G. COOPER.

News has been received of the death at Hayward, Alameda County, California, of Dr. James G. Cooper, at the age of seventy-two years, July 19, 1902. Dr. Cooper's services to science have been such (coupled with the singular omission of his name and his father's from the chief records of American biography) as to render some statement of them desirable for a generation to whom he was little known.

James Cooper, an English merchant, settled in New York shortly after the Revolution, accumulated a competency and died in 1801, leaving a son, William Cooper, born in 1798. At an early age the latter, who had inherited the love of nature from his mother, Frances Graham, determined to devote himself to the study of Natural History. At the age of eighteen young Cooper became one of the founders of the Lyceum of Natural History, now the New York Academy of Sciences, under the lead of Dr. S. L. Mitchill, John Torrey, Daniel Barnes and others, and soon became a generous contributor to its library and one of its officers. In 1821 William Cooper sailed for Europe to continue his studies in zoology and was elected the first American member of the Zoological Society of London. He attended the lectures of Cuvier at Paris, and on his return devoted himself to ornithology and paleontology. He was a friend of Schoolcraft, a correspondent and colaborer of Lucien Bonaparte, who dedicated to him the well-known *Falco Cooperi.* His son, James G. Cooper, was born June 19, 1830, and in 1851 graduated from the College of Physicians and Surgeons, New York, following it by a two years' course in the city hospitals. In 1853 he was appointed surgeon to the northern division of the Pacific Railroad Survey, at the suggestion of Professor S. F. Baird, and spent some time at the Smithsonian Institution, preparing himself for the duties